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A sewage plant is 99% efficient in eliminating bacteria in Accra, Ghana: time to scale up and do more !

[1] Adomako LAB, Yirenya-Tawiah D, Nukpezah D, Abrahamya A, Labi AK, Grigoryan R, Ahmed H, Owusu-Danquah J, Annang TY, Banu RA, Osei-Atweneboana MY, Timire C, Tweya H, Ackon SED, Nartey E, Zachariah R. *Reduced Bacterial Counts from a Sewage Treatment Plant but Increased Counts and Antibiotic Resistance in the Recipient Stream in Accra, Ghana-A Cross-Sectional Study.* **Trop Med Infect Dis. 2021 May 14;6(2):79**.

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Key Messages

- This study showed that the Legon sewage treatment plant reduced bacterial count in sewage by 99% before its discharge into the Onyasia Stream. This highlights its usefulness in preventing environmental contamination.
- However, bacterial counts progressively increased by 99.5% between 1000 metres upstream and downstream to the outflow point in the Onyasia Stream, suggesting intense contamination from other sources. These bacteria, were resistant (33%-80%) to 'highly or critically important antibiotics' for human use.
- Immediate action is needed, such as informing communities on the non potable nature of the stream water, ensuring disinfection of vegetable products grown along the stream, and providing farmers with protective wear to reduce contact with contaminated water.
- Longer term action include recommissioning non-functional sewage treatment plants and adopting safer irrigation methods.

What is the problem and why is it important?

Sewage treatment plants receive influents containing high concentrations of bacteria and antibiotics and are hotspots for bacterial multiplication and antibiotic resistance development.

Effluents from the Legon sewage treatment plant are discharged directly into the Onyasia Stream. This stream water is used to irrigate farms and for human and animal use (Fig 1). Thus, resistant bacteria, in the stream, would "connect" with and spread to humans and animals. Here we report on the efficiency of the Legon sewage treatment plant in reducing bacterial counts and the level of bacterial contamination from other sources in the Onyasia stream.

Figure 1. Onyasia stream showing water being abstracted for irrigation and a lettuce farm along the banks of the Onyasia stream.

How did we measure it?

Over a six-month period (January to June 2018), Legon sewage and Onyasia stream water samples were collected and assessed for bacterial counts and antibiotic resistance using quality-controlled laboratory procedures.

What did we find?

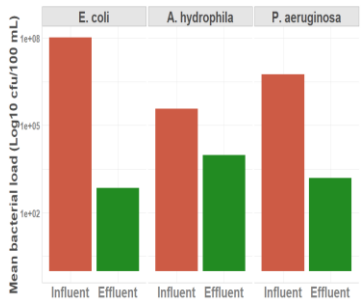

Figure 2. Significant reduction in bacterial counts between influent and effluent sewage of the Legon sewage plant.

- The Legon sewage treatment plant significantly reduced bacterial counts of *Escherichia coli*, *Aeromonas hydrophila* and *Pseudomonas aeruginosa* by over 99% in effluents (Fig 2).
- However, bacterial counts progresively increased by 99.5% between 1000 metres of upstream and downstream points in the Onyasia Stream, suggesting intense contamination from other sources. The increase was most marked for *Escherichia coli*, implying intense fecal contamination (Fig 3).
- Depending on the type of bacteria, the highest resistance levels ranged from 33% to 80% for antibiotics listed by WHO to be "highly or critically important for human use".

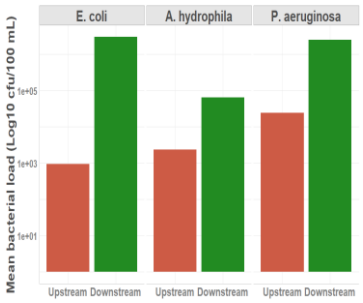

Figure 3. Significant increase in bacterial counts between upstream and downstream sites in the Onyasia stream.

Implications

- This study highlights the potential importance of stream water in the spread of AMR in Ghana, and the vital role sewage treatment plants can play in reducing its contamination.
- We also highlight intense bacterial contamination of the Onyasia stream with highly resistant bacteria from other sources, possibly houshold sewage discharge. As the Onyasia stream water is used by humans and animals, there is a high risk of acqusition and tranmisson of AMR and spread of disease.
- The findings call for immediate action, such as informing communities on the need to boil the stream water before household use, ensuring disinfection of vegetable products grown along the stream, and providing farmers with protective wear to reduce contact with contaminated water.
- Longer term measures include recommissioning non-functional sewage treatment plants, considering septic tanks for households, and adopting irrigation methods that eliminate contact between contaminated water and green vegetables.
- Further research is needed to identify the important sources of faecal contamination of the Onyasia Stream.